

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

UNDERGROUND OUTLET

(Feet)

CODE 620

DEFINITION

A conduit installed beneath the surface of the ground to collect surface water and convey it to a suitable outlet.

PURPOSE

Dispose of excess water from terraces, diversions, subsurface drains, surface drains, trickle tubes or principal spillways from dams (outside the dam area only), or other concentrations without causing damage by erosion or flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where: (1) excess surface water needs to be disposed of; (2) a buried outlet is needed for Diversions (362), Terraces (600), or similar practices; (3) an underground outlet can be installed that will safely dispose of excess water; and (4) surface outlets are impractical because of stability problems, climatic conditions, land use, or equipment traffic.

CRITERIA

Capacity. The underground outlet shall be designed, alone or in combination with other practices, with adequate capacity to insure that the terrace, diversion, or other practices function according to the standard for the specific practice. For example, an underground outlet can be used in combination with a grassed waterway or a surface drain to carry part of the design flow. The capacity of the underground outlet for natural or

constructed basins shall be adequate for the intended purpose without causing excessive damage to crops, vegetation, or improvements. For crops or vegetation, the conduit shall have the capacity to remove water in 48 hours or less. The main conduit diameter will be based on the storage volume from runoff using reduced curve numbers.

Inlet. An inlet can be a collection box, a perforated riser, or other appropriate device. Its capacity shall be adequate to provide the maximum design flow in the conduit. Flow-control devices shall be installed as necessary. Perforated risers must be of durable material, structurally sound, and resistant to damage by rodents or other animals. The minimum diameter of inlets shall be 4 inches. Inlets shall be of rigid material which does not require supplemental support to remain in a vertical position. Only the top inlet in the terrace system may be placed directly on the main conduit. All other inlets shall be offset a minimum of 8 feet. If burning of vegetation is likely to create a fire hazard, the inlet shall be fire resistant. Blind inlets can be used where they are effective. Collection boxes must be large enough to facilitate maintenance and cleaning operations. The inlet must have an appropriate trash guard to insure that trash or other debris entering the inlet passes through the conduit without plugging. It must also have an animal guard to prevent the entry of rodents or other animals.

Pressure-relief wells shall be designed and installed as needed to control pressure. If junction boxes and other structures are needed, they shall be designed and installed in a manner that facilitates cleaning and other maintenance activities.

Hydraulics. Underground outlets shall be continuous conduits, tubing, or tile. Joints shall be hydraulically smooth, and the materials and methods used shall be recommended by the manufacturer. If a pressure system is used, joints shall be adequate to withstand the design pressure, including surges and vacuum. The maximum velocity must not exceed the safe velocity for the conduit materials and installation.

Lines shall be adequate to carry the design flow when the outlet and all inlets are operating at design capacity. Capacity shall be based on the conduit size as determined by design charts in Engineering Field Handbook Chapter 14, Water Management (Drainage). Positive grade shall be maintained in all sections of an underground outlet. Capacity shall be based on the pipe size or on other flow control devices to prevent water from the upper inlets from discharging through the lower inlets. The minimum conduit diameter shall be 3 inches.

Materials. Materials shall meet or exceed the design requirements against leakage and shall withstand internal pressure or vacuum and external loading. Plastic, concrete, aluminum, and steel shall meet the requirements specified in the applicable ASTM standard or NRCS Conservation Practice Standard 430 – Irrigation Water Conveyance and references thereto. All materials specified for Conservation Practice Standard 606 – Subsurface Drains can be used for underground outlets. Conduits, however, can be perforated or nonperforated, depending on the design requirements. A filter fabric wrap (sock) or equivalent shall be used if migration of soil particles around conduit is anticipated. All exposed plastic materials shall be protected from degradation due to exposure to sunlight.

Outlet. The outlet shall be sufficiently stable for all anticipated flow conditions. It shall be designed for the maximum anticipated water surface at design flow. A continuous section of closed conduit or a headwall can be used at the outlet. If a closed conduit is used, it shall be durable and strong enough to withstand all anticipated loads, including those caused by ice. Outlets shall not be placed in areas of active erosion. If fire is a hazard, the outlet shall be fire resistant. All outlets must have

animal guards to prevent the entry of rodents or other animals. Animal guards must be hinged to allow passage of debris.

Excavation and Backfill. Trench excavation shall be grooved in the center for proper conduit bedding. The maximum trench width shall be the conduit diameter plus 24 inches. The minimum trench width shall be the conduit diameter plus 6 inches, except when the trench is shaped to fit the conduit, additional width is not required. The minimum cover over all types of conduits shall be 24 inches.

Protection. All disturbed areas shall be reshaped and regraded so that they blend with the surrounding land features and conditions. Visual resources must be given the same consideration as other design features. Areas that are not to be farmed or covered by structural works shall be established to vegetation or otherwise protected from erosion as soon as practicable after construction.

CONSIDERATIONS

Consider effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

Consider effects on the volume of downstream flow that might cause undesirable environmental, social, or economic effects.

Evaluate potential use for water management.

Consider effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances that would be carried by runoff.

Consider effects on the visual quality of downstream water resources.

Consider the construction-related effects on the quality of downstream watercourses.

Consider effects on wetlands or water-related wildlife habitats.

Evaluate potential impact on water quality due to agri-chemicals in outflow.

Consider depth of underground outlet in regard to tillage equipment depth and maintenance, if applicable.

Consider protecting the riser with an entry guard from livestock and farming activities.

Plans and specifications

Plans and specifications for installing underground outlets shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose.

Operation and Maintenance

Underground outlets shall be maintained by:

- Keeping inlets, trash guards, and collection boxes and structures clean and free of materials that can reduce the flow
- Repairing leaks and broken or crushed lines to insure proper functioning of the conduit
- Checking outlet conduit and animal guards to ensure proper functioning of the conduit
- Keeping adequate backfill over the conduit
- Repairing any eroded areas at the pipe outlet

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION
FOR
UNDERGROUND OUTLET
(620)

Underground Outlet Specifications

Conduits and appurtenances shall be installed to the line and grade shown in the plans or as staked in the field and according to the recommendations of the manufacturers. Conduits shall be bedded and backfilled as shown in the plans or as described in the specifications for the job. Mechanical compaction, water packing, or other means of compaction shall be specified in the plans or in the specifications for the job. Water packing of the conduit beneath a terrace is required unless the terrace system is installed the following season.

Materials shall meet the requirements of this standard and those in the plans or in the specifications for the job. The ends of the conduits shall be protected during installation. All appurtenant structures, including trash and animal guards, shall be installed promptly, and provisions shall be made for protecting them during installation.

Work areas shall be restored to their former condition or as required in the plans and to the specifications for the job. Vegetation or other protective cover shall be established promptly.

Additional Details:
